Local Government Energy Audit:

Energy Audit Report

William T. Hiering Science Building (#27)

Ocean County College

1 College Drive
Toms River, NJ 08754

October 18, 2018

Final Report by:

TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate saving are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

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1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for the William T. Hiering Science Building.

The goal of a LGEA is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and put you in a position to implement the ECMs. The LGEA also sets you on the path to receive financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing the ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey high education institutions in controlling energy costs and protecting our environment by offering a full spectrum of energy management options.

1.1 Facility Summary

William T. Hiering Science Building (#27) at Ocean County College is a 27,088 square foot two-story building constructed in 2000. The building has a flat roof. Interior lighting is predominantly linear T8 lamp fixtures with electronic ballasts. Heating is provided by two hot water boilers and one rooftop packaged unit. The building is supplied with chilled water from the campus-wide chilled water distribution loop. It receives electric power via the campus main account (with JCP&L). The building had no separate utility meters onsite during the site visit.

A thorough description of the facility and our observations are in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated 11 measures. Ten measures were recommended for implementation, which together represent an opportunity for William T. Hiering Science Building (#27) to reduce annual energy costs by $33,597 and annual greenhouse gas emissions by 206,577 lbs CO_2e. The measures would pay for themselves in 1.97 years. The breakdown of existing and potential utility costs is illustrated in Figure 1 and Figure 2, respectively. These measures represent an opportunity to reduce William T. Hiering Science Building's annual energy use by 6.4%.

Figure 1 – Previous 12 Month Utility Costs

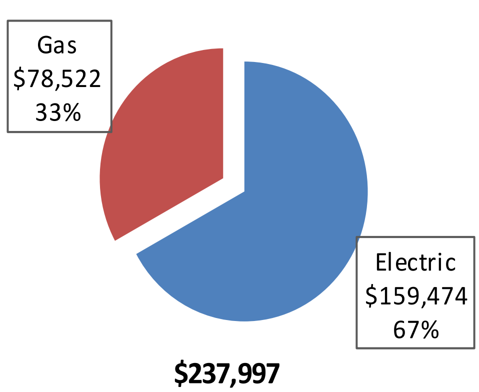
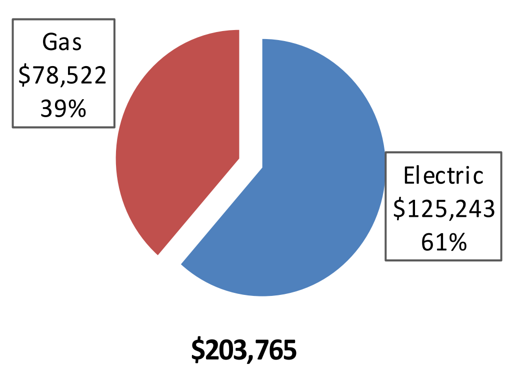


Figure 2 – Potential Post-Implementation Costs



A detailed description of William T. Hiering Science Building (27)'s existing energy use can be found in Section 3.

The evaluated measures have been listed and grouped into major categories as shown in Figure 3. Brief descriptions of the categories can be found below and descriptions of the individual opportunities can be found in Section 4. Measures without an "ECM #" in the table below have been evaluated but are not recommended for implementation.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**80,454**	**11.0**	**$13,176.11**	**$31,870.37**	**$4,990.00**	**$26,880.37**	**2.04**	**81,016**
ECM 1	Install LED Fixtures	Yes	4,770	0.6	$781.17	$3,125.42	$800.00	$2,325.42	2.98	4,803
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	Yes	1,590	0.2	$260.39	$1,334.88	$0.00	$1,334.88	5.13	1,601
ECM 3	Retrofit Fixtures with LED Lamps	Yes	69,653	9.8	$11,407.19	$26,011.86	$4,190.00	$21,821.86	1.91	70,140
ECM 4	Install LED Exit Signs	Yes	4,441	0.3	$727.37	$1,398.22	$0.00	$1,398.22	1.92	4,472
Lighting Control Measures			**16,075**	**2.2**	**$2,632.62**	**$5,002.00**	**$655.00**	**$4,347.00**	**1.65**	**16,187**
ECM 5	Install Occupancy Sensor Lighting Controls	Yes	14,246	1.9	$2,333.17	$4,002.00	$655.00	$3,347.00	1.43	14,346
ECM 6	Install High/Low Lighitng Controls	Yes	1,828	0.2	$299.45	$1,000.00	$0.00	$1,000.00	3.34	1,841
Motor Upgrades			**3,877**	**1.2**	**$634.97**	**$11,192.76**	**$0.00**	**$11,192.76**	**17.63**	**3,904**
	Premium Efficiency Motors	No	3,877	1.2	$634.97	$11,192.76	$0.00	$11,192.76	17.63	3,904
Variable Frequency Drive (VFD) Measures			**108,614**	**14.1**	**$17,788.04**	**$34,312.70**	**$800.00**	**$33,512.70**	**1.88**	**109,374**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	Yes	10,868	3.7	$1,779.89	$6,551.70	$800.00	$5,751.70	3.23	10,944
ECM 8	Install VFDs on Chilled Water Pumps	Yes	47,330	4.8	$7,751.28	$10,388.90	$0.00	$10,388.90	1.34	47,661
ECM 9	Install VFDs on Hot Water Pumps	Yes	50,417	5.5	$8,256.87	$17,372.10	$0.00	$17,372.10	2.10	50,769
Plug Load Equipment Control - Vending Machine			**0**	**0.0**	**$0.00**	**$1,437.60**	**$0.00**	**$1,437.60**	**0.00**	**0**
ECM 10	Vending Machine Control	Yes	0	0.0	$0.00	$1,437.60	$0.00	$1,437.60	0.00	0
TOTALS FOR RECOMMENDED MEASURES			**205,143**	**27.2**	**$33,596.77**	**$72,622.67**	**$6,445.00**	**$66,177.67**	**1.97**	**206,577**
TOTALS FOR EVALUATED MEASURES			**209,020**	**28.4**	**$34,231.74**	**$83,815.43**	**$6,445.00**	**$77,370.43**	**2.26**	**210,482**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measures save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when conditions allow. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Motor Upgrades generally involve replacing old standard efficiency motors with motors of the current efficiency standard (EISA 2007). Motors will be replaced with the same size motors. This measure saves energy by reducing the power used by the motors due to improved electrical efficiency.

Variable Frequency Drives measures generally involve controlling the speed of a motor to achieve a flow or temperature rather than using a valve, damper, or no means at all. These measures save energy by slowing a motor which is an extremely efficient method of control.

Plug Load Equipment control measures generally involve installing automation that limits the power use or operation of equipment plugged into an electrical receptacle based on occupancy.

Energy Efficient Practices

TRC also identified seven low cost (or no cost) energy efficient practices. A facility's energy performance can be significantly improved by employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems. Through these practices equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. Opportunities identified at the William T. Hiering Science Building (#27) include:

- Perform Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Use Thermostat Schedules and Temperature Resets
- Clean and/or Replace HVAC Filters
- Install Plug Load Controls
- Water Conservation

For details on these energy efficient practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing self-generation sources for William T. Hiering Science Building (27). Based on the configuration of the site and its loads there is a low potential for installing any PV and combined heat and power self-generation measures.

For details on our evaluation and the on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, the equipment changes outlined for each ECM need to be selected and installed through project implementation. One of the first considerations is if there is capital available for project implementation. Another consideration is whether to pursue individual ECMs, a group of ECMs, or a comprehensive approach wherein all ECMs are pursued, potentially in conjunction with other facility projects or improvements.

Rebates, incentives, and financing are available from the NJBPU, NJCEP, as well as some of the state's investor-owned utilities, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any project, please review the appropriate incentive program guidelines before proceeding. This is important because in most cases you will need to submit an application for the incentives before purchasing materials and beginning installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- Energy Savings Improvement Program (ESIP)

For facilities with capital available for implementation of selected individual measures or phasing implementation of selected measures over multiple years, incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to design the ECM(s), select the equipment and apply for the incentive(s). Program pre-approval is required for some SmartStart incentives, so only after receiving approval may the ECM(s) be installed. The incentive values listed above in Figure 3 represent the SmartStart program and will be explained further in Section 8, as well as the other programs as mentioned below.

For facilities without capital available to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with external project development, design, and implementation services as well as financing for implementing ECMs. This LGEA report is the first step for participating in ESIP and should help you determine next steps. Refer to Section 8.2 for additional information on the ESIP Program.

Additional descriptions of all relevant incentive programs are located in Section 8 or: www.njcleanenergy.com/ci.

To ensure projects are implemented such that maximum savings and incentives are achieved, bids and specifications should be reviewed by your procurement personnel and/or consultant(s) to ensure that selected equipment coincides with LGEA recommendations, as well as applicable incentive program guidelines and requirements.

2 FACILITY INFORMATION AND EXISTING CONDITIONS

2.1 Project Contacts

Figure 4 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
James Calamia	Director of Facilities	jcalamia@ocean.edu	732-255-0400 x 2066
Designated Representative			
John Jack	Maintenance Technician		732-255-0400
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On June 15, 2016, TRC performed an energy audit at William T. Hiering Science Building (#27) located in Toms River, New Jersey. TRC's auditor met with John Jack to review the facility operations and focus the investigation on specific energy-using systems.

The two-story building is a 27,088-square foot facility constructed in 2000 and houses six laboratories, one large classroom, a lecture hall with 120 seats, and faculty/staff offices.

The building receives electric power via the campus main account (with JCP&L). The building has no separate utility meters or submeters. The breakdown of energy usage is based on both our estimates of Science Building (#27)'s share of the total electric and gas loads as well as number and sizes of the energy-using equipment on site.

2.3 Building Occupancy

The building is used year-round and the occupancy varies with classes. The typical schedule is presented in the table below.

Figure 5 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
William T.Hiering Science Building	Weekday	7:00AM - 10:00PM
William T.Hiering Science Building	Weekend	10:00AM - 06:00PM

2.4 Building Envelope

The two-story building has a reinforced concrete foundation. The building has a flat, built up roof covered with slight white stone. Exterior walls are brick faced. The windows throughout the facility are in good condition and appear to be well maintained. Typical windows throughout the school are double paned clear glass with aluminum frames.

2.5 On-Site Generation

The campus has a 1.1 MW Waukesha reciprocating engine, combined heat and power (CHP) power plant at the Central Plant. The CHP plant generates a significant portion of the power used by the William T. Hiering Science Building (#27) and other central campus buildings.

2.6 Energy-Using Systems

Please refer to Appendix A: Equipment Inventory & Recommendations for an inventory of equipment.

Lighting System

Lighting is provided predominately by 32-Watt linear fluorescent T8 lamps with electronic ballasts as well as recessed compact fluorescent lamps (CFL). The hallways and lecture hall are illuminated with a combination of linear 32-Watt fluorescent T8 and 26-Watt recessed CFLs while the administrative offices and classrooms are illuminated with linear 32-Watt fluorescent T8. A small number of 20-Watt fluorescent T12 lamps are found in room 216 and freezer laboratory. Lighting control is provided by both occupancy sensors and manual wall switches.

Chilled Water and Condenser Water System

The building is supplied with chilled water from the campus-wide chilled water distribution loop.

Hot Water

The hot water system consists of two Smith gas-fired non-condensing boilers with an output capacity of 1,709 MBh and a combustion efficiency of 85% each. They are configured in constant flow distribution with two 7.5 hp hot water supply pumps and two 5 hp return pumps. The pumps provide hot water to air handlers 1 and 2 equipped with hot water coil for heating and the perimeter convection heaters. The hot water distribution is based on a reset schedule. The boilers appear to be original to the building. They are in good condition and well maintained. Heat to the building is also provided by a campus-wide hot water distribution loop.

Air Conditioning (DX)

One 15-ton Trane direct-expansion (DX) packaged unit with a gas-fired furnace is used to condition the building. It is located on the roof. The unit is a constant air volume with a single 2 hp supply fan and no return fan. The gas-fired furnace section has an output capacity of 280 MBh and is used as a supplemental heating. The unit is controlled by programmable thermostats.

Domestic Hot Water

The domestic hot water system for the facility consists of one A.O. Smith gas fired non-condensing hot water heater with an input rating of 250 MBh and a 100-gallon storage tank. The water heater is eight years old and is in the mechanical room. It appears to be in good condition.

Plug load & Vending Machines

The building has approximately 49 computers that are mostly computers with LCD monitors. Other plug load equipment consists of copy machines, printers, microwaves, classrooms projectors, small refrigerators and two electric aquariums. The facility has two vending machines.

2.7 Water-Using Systems

There are several restrooms at this facility. A sampling of restrooms found that faucets are rated as low flow faucets.

3 SITE ENERGY USE AND COSTS

Nearly the entire campus receives electricity through a master electric meter. The main meter was prorated for individual buildings based on building size and function. Utility data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are many factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. Sub-meter data was not available for a full 12-month period. So, we estimated consumption for each building to divide up the energy purchases through the mater electric and gas accounts. Annual electric usage for each building on the main account was estimated from the partial year submeter data that was available. Thermal load for each building on the central heating and cooling loops was apportioned according to building square footage. These estimates were complicated by the fact that the amount of electricity produced by the Central Plant's CHP system could not be determined precisely for the billing period for which we had utility bills. So, our usage estimates may vary from current actual energy usage for some buildings that are supplied by master metered electric and gas accounts.

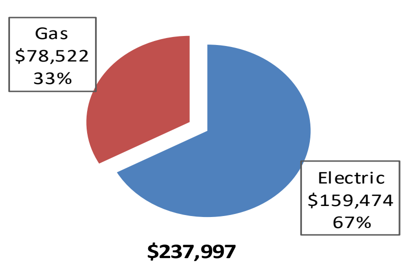
The William T. Hiering Science Building (#27) receives all electric and thermal energy from the campus' mater electric and gas accounts. Below is our estimate of the portion of energy consumptions and costs that can be attributed to the Library building.

Figure 6 - Utility Summary

Utility Summary for William T. Hiering Science Building		
Fuel	**Usage**	**Cost**
Electricity	973,756 kWh	$159,474
Natural Gas	78,976 Therms	$78,522
Total		**$237,997**

The current utility cost for this site is $237,997 as shown in the chart below.

Figure 7 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. It is supplied via the main electric account for the campus and distributed to Science Building (#27) and other buildings. The average electric cost over the past 12 months on the main account was $0.164/kWh. This is a blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The monthly estimated electricity consumption and peak demand are shown in the chart below.

Figure 8 - Graph of Electric Usage & Demand

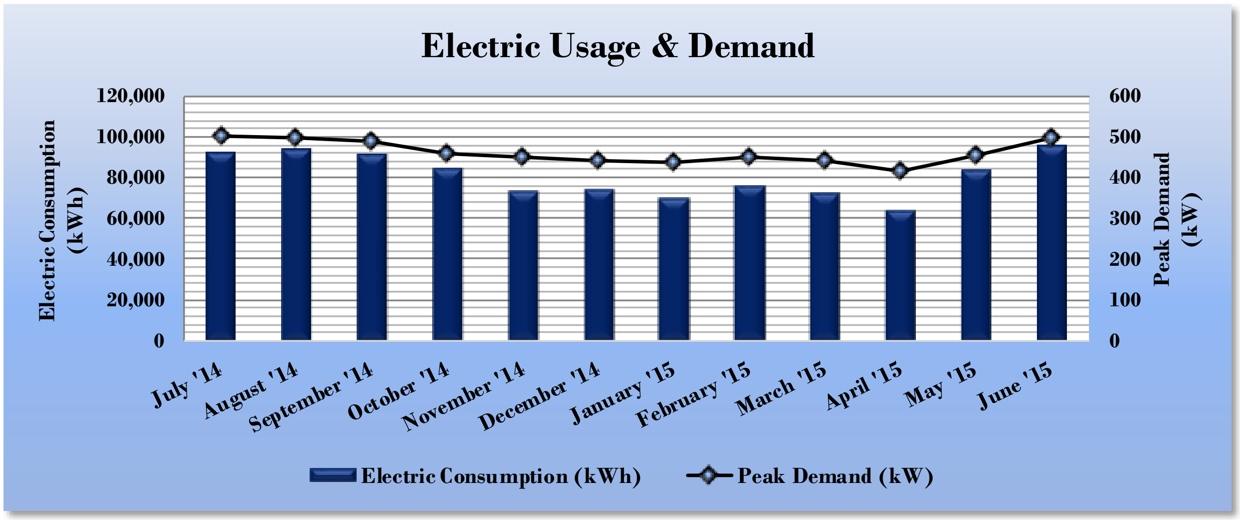


Figure 9 - Table of Electric Usage & Demand

Electric Billing Data for William T. Hiering Science Building						
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost	TRC Estimated Usage?
8/6/14	30	92,210	501		$10,660	Yes
9/5/14	30	94,319	499		$14,558	Yes
10/3/14	28	92,125	487		$14,932	Yes
11/4/14	32	84,545	457		$14,440	Yes
12/5/14	31	73,796	449		$12,961	Yes
1/6/15	32	74,851	443		$12,398	Yes
2/5/15	30	70,533	439		$12,943	Yes
3/6/15	29	76,424	448		$17,838	Yes
4/7/15	32	73,171	441		$11,569	Yes
5/7/15	30	63,845	415		$10,631	Yes
6/8/15	32	84,161	454		$13,540	Yes
7/8/15	30	96,445	499		$13,442	Yes
Totals	**366**	**976,424**	**500.73**	**$0**	**$159,911**	Yes
Annual	**365**	**973,756**	**500.73**	**$0**	**$159,474**	

3.3 Natural Gas Usage

Natural gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $0.994/therm, which is the blended rate used throughout the analyses in this report. The monthly gas consumption is represented graphically in the chart below.

Figure 10 - Graph of Natural Gas Usage

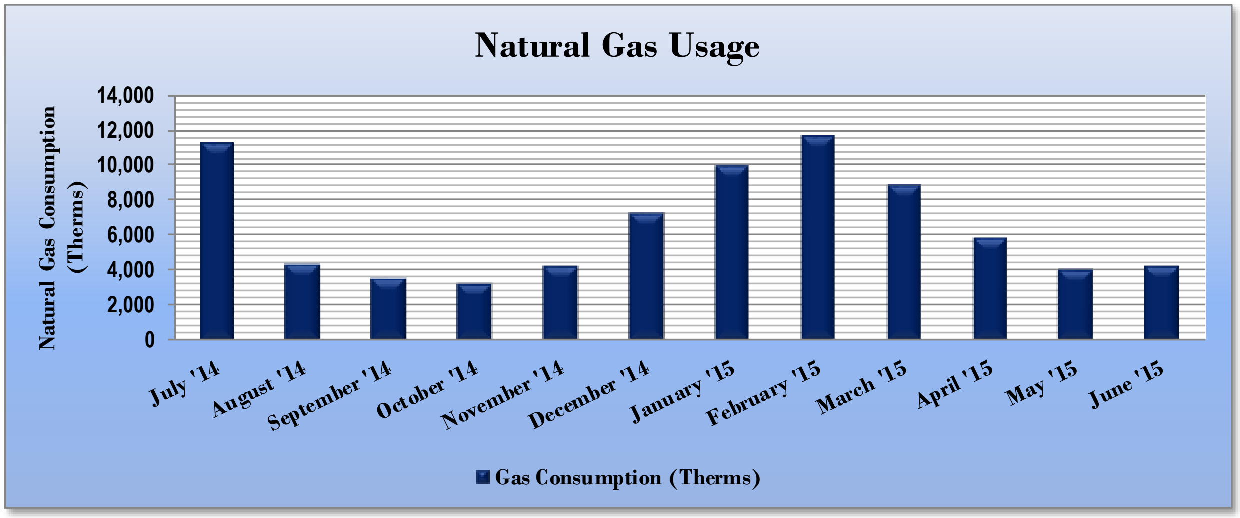


Figure 11 - Table of Natural Gas Usage

Gas Billing Data for William T. Hiering Science Building				
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost	TRC Estimated Usage?
8/1/14	31	11,278	$9,677	Yes
9/1/14	31	4,367	$4,627	Yes
10/1/14	30	3,579	$3,915	Yes
11/1/14	31	3,238	$3,252	Yes
12/1/14	30	4,290	$3,955	Yes
1/1/15	31	7,328	$7,588	Yes
2/1/15	31	10,038	$10,136	Yes
3/1/15	28	11,712	$11,773	Yes
4/1/15	31	8,917	$8,899	Yes
5/1/15	30	5,918	$6,076	Yes
6/1/15	31	4,056	$4,294	Yes
7/1/15	30	4,255	$4,329	Yes
Totals	**365**	**78,976**	**$78,522**	12
Annual	**365**	**78,976**	**$78,522**	

3.4 Benchmarking

This facility was benchmarked through Portfolio Manager®, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager® analyzes your building's consumption data, cost information, and operational use details and compares its performance against a yearly baseline, national medians, or similar buildings in your portfolio. Metrics used in this comparison are the energy use intensity (EUI) and ENERGY STAR® Score.

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more energy than similar buildings on a square foot basis or if that building performs better than the median. EUI is presented in both site energy and source energy. Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy is the raw fuel consumed to generate the energy consumed at the site, factoring in energy production and distribution losses.

Due to the many uncertainties regarding electric and gas end-usage for buildings on master metered accounts (as discussed in Sections 3.2 and 3.3 above), we have provided a combined benchmarking (in kBTU/sq-ft) for all campus buildings that are served by master electric and gas accounts.

Figure 12 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	William T. Hiering Science Building	National Median Building Type: Higher Education - Private
Source Energy Use Intensity (kBtu/ft^2)	691.3	262.6
Site Energy Use Intensity (kBtu/ft^2)	414.2	130.7

By implementing all recommended measures covered in this reporting, the project's estimated post-implementation EUI improves as shown in the Table below:

Figure 13 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	William T. Hiering Science Building	National Median Building Type: Higher Education - Private
Source Energy Use Intensity (kBtu/ft^2)	610.1	262.6
Site Energy Use Intensity (kBtu/ft^2)	388.4	130.7

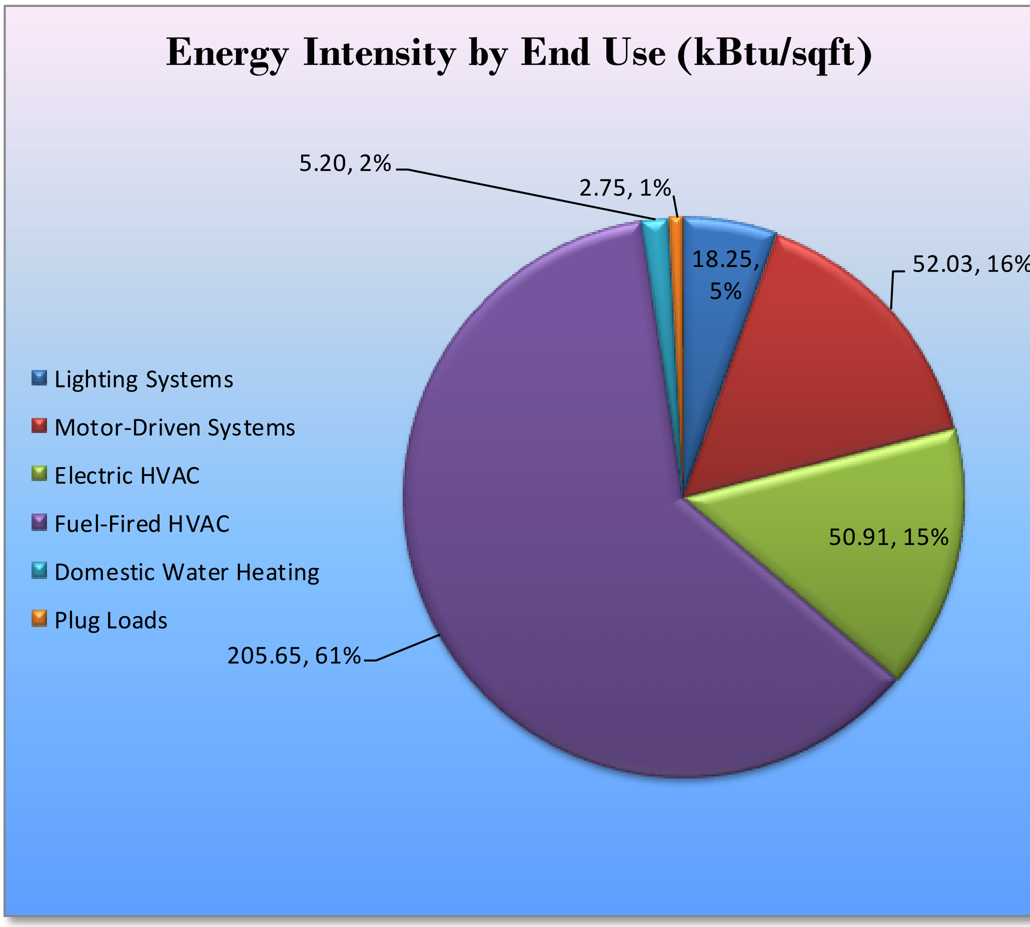
Many buildings can also receive a 1 – 100 ENERGY STAR® score. This score compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide — and may be eligible for ENERGY STAR® certification. This building type does not currently qualify to receive a score.

The Portfolio Manager®, Statement of Energy Performance can be found in Appendix B: ENERGY STAR® Statement of Energy Performance.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building and determine their proportional contribution to overall building energy usage. This visual representation of energy end uses highlights systems that may benefit most from energy efficiency projects.

Figure 14 - Energy Balance (% and kBtu/SF)



4 Energy Conservation Measures

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the William T. Hiering Science Building (#27) regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 15 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**80,454**	**11.0**	**0.0**	**$13,176.11**	**$31,870.37**	**$4,990.00**	**$26,880.37**	**2.04**	**81,016**
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ECM 5	Install Occupancy Sensor Lighting Controls	14,246	1.9	0.0	$2,333.17	$4,002.00	$655.00	$3,347.00	1.43	14,346
ECM 6	Install High/Low Lighitng Controls	1,828	0.2	0.0	$299.45	$1,000.00	$0.00	$1,000.00	3.34	1,841
Variable Frequency Drive (VFD) Measures		**108,614**	**14.1**	**0.0**	**$17,788.04**	**$34,312.70**	**$800.00**	**$33,512.70**	**1.88**	**109,374**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	10,868	3.7	0.0	$1,779.89	$6,551.70	$800.00	$5,751.70	3.23	10,944
ECM 8	Install VFDs on Chilled Water Pumps	47,330	4.8	0.0	$7,751.28	$10,388.90	$0.00	$10,388.90	1.34	47,661
ECM 9	Install VFDs on Hot Water Pumps	50,417	5.5	0.0	$8,256.87	$17,372.10	$0.00	$17,372.10	2.10	50,769
Plug Load Equipment Control - Vending Machine		**0**	**0.0**	**0.0**	**$0.00**	**$1,437.60**	**$0.00**	**$1,437.60**	**0.00**	**0**
ECM 10	Vending Machine Control	0	0.0	0.0	$0.00	$1,437.60	$0.00	$1,437.60	0.00	0
TOTALS		**205,143**	**27.2**	**0.0**	**$33,596.77**	**$72,622.67**	**$6,445.00**	**$66,177.67**	**1.97**	**206,577**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Our recommendations for upgrades to existing lighting fixtures are summarized in Figure 16 below.

Figure 16 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**80,454**	**11.0**	**0.0**	**$13,176.11**	**$31,870.37**	**$4,990.00**	**$26,880.37**	**2.04**	**81,016**
ECM 1	Install LED Fixtures	4,770	0.6	0.0	$781.17	$3,125.42	$800.00	$2,325.42	2.98	4,803
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers	1,590	0.2	0.0	$260.39	$1,334.88	$0.00	$1,334.88	5.13	1,601
ECM 3	Retrofit Fixtures with LED Lamps	69,653	9.8	0.0	$11,407.19	$26,011.86	$4,190.00	$21,821.86	1.91	70,140
ECM 4	Install LED Exit Signs	4,441	0.3	0.0	$727.37	$1,398.22	$0.00	$1,398.22	1.92	4,472

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	4,770	0.6	0.0	$781.17	$3,125.42	$800.00	$2,325.42	2.98	4,803
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

This measure evaluates replacing existing fixtures containing metal halide lamps with new high-performance LED light fixtures. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

Maintenance savings are anticipated since LED sources have burn hours which are generally more than twice that of a HID source. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

ECM 2: Retrofit Fluorescent Fixtures with LED Lamps and Drivers

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	1,590	0.2	0.0	$260.39	$1,334.88	$0.00	$1,334.88	5.13	1,601
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

This measure evaluates replacing linear fluorescent T12 lamps, ballasts, and reflectors with LED tube lamps, reflectors, and drivers specifically designed for existing linear fluorescent fixtures. The retrofit uses the existing fixture housing but replaces the rest of the components with an efficient source and reflectors designed for LEDs. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output and efficiently projects the light into the space.

Maintenance savings are anticipated since LED sources have burn hours which are more than twice that of a fluorescent source. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

ECM 3: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	69,653	9.8	0.0	$11,407.19	$26,011.86	$4,190.00	$21,821.86	1.91	70,140
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

This measure evaluates replacing linear fluorescent lamps with LED tube lamps and replacing compact fluorescent screw-in/plug-in based lamps with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed although there is a fluorescent fixture ballast in place. Other tube lamps require that fluorescent fixture ballasts be removed or replaced with LED drivers. Screw-in/plug-in LED lamps can be used as a direct replacement for most other screw-in/plug-in lamps. This measure saves energy by installing LED sources which use less power than other technologies with a comparable light output.

Maintenance savings are anticipated since LED sources have burn hours which are more than twice that of a fluorescent source. LED lamps that use the existing fluorescent fixture ballast will be constrained by the remaining hours of the ballast. Maintenance savings may be partially offset by the higher material costs associated with LED sources.

ECM 4: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	4,441	0.3	0.0	$727.37	$1,398.22	$0.00	$1,398.22	1.92	4,472
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.00	0

Measure Description

This measure evaluates replacing incandescent lighting in exit signs with LEDs. LED sources require virtually no maintenance and LED exit signs have a life expectancy of at least 20 years. Many manufacturers can provide retrofit kits that meet fire and safety code requirements. Retrofit kits are less expensive and simpler to install than replacement signs, however, new fixtures would have a longer useful life and are therefore recommended.

A reduction in maintenance costs will be realized with the proposed retrofit because lamps will not have to be replaced as frequently.

4.1.2 Lighting Control Measures

Our recommendations for lighting control measures are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**16,075**	**2.2**	**0.0**	**$2,632.62**	**$5,002.00**	**$655.00**	**$4,347.00**	**1.65**	**16,187**
ECM 5	Install Occupancy Sensor Lighting Controls	14,246	1.9	0.0	$2,333.17	$4,002.00	$655.00	$3,347.00	1.43	14,346
ECM 6	Install High/Low Lighitng Controls	1,828	0.2	0.0	$299.45	$1,000.00	$0.00	$1,000.00	3.34	1,841

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 5: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
14,246	1.9	0.0	$2,333.17	$4,002.00	$655.00	$3,347.00	1.43	14,346

Measure Description

This measure evaluates installing occupancy sensors to control light fixtures that are currently manually controlled in restrooms, classrooms, and private offices. Sensors detect occupancy using ultrasonic and/or infrared wave technologies. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Occupants will also be able to manually turn off fixtures. Energy savings result from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. Ceiling-mounted or remote-mounted sensors require the use of low voltage switching relays or a wireless signal to the switch. In general, use wall switch replacement sensors for single occupant offices and other small rooms. Install ceiling-mounted or remote mounted sensors in locations without local switching, in situations where the existing wall switches are not in the line-of-sight of the main work area, and in large spaces. We recommend a holistic design approach that considers both the technology of the lighting sources and how they are controlled.

Maintenance savings are anticipated due to reduced lamp operation, however, additional maintenance costs may be incurred because the occupancy sensors may require periodic adjustment; it is anticipated that the net effect on maintenance costs will be negligible.

ECM 6: Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
1,828	0.2	0.0	$299.45	$1,000.00	$0.00	$1,000.00	3.34	1,841

Measure Description

This measure evaluates installing occupancy sensors to provide dual level lighting control for light fixtures in spaces that are infrequently occupied but require continuous or night lighting for safety or security reasons. Typical areas for such lighting control are stairwells, interior corridors, parking lots and parking garages.

The light fixtures operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared wave technologies. The lighting systems are switched to the high level setting when an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period.

For this application the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage should be provided to turn lights on in an area as an occupant approaches the area.

Maintenance savings are anticipated due to reduced lamp operation, however additional maintenance costs may be incurred because the occupancy sensors may require periodic adjustment; it is anticipated that the net effect on maintenance costs will be negligible.

4.1.3 Variable Frequency Drive Measures

Our recommendations for variable frequency drive (VFD) measures are summarized in Figure 18 below.

Figure 18 – Summary of Variable Frequency Drive ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Variable Frequency Drive (VFD) Measures		**108,614**	**14.1**	**0.0**	**$17,788.04**	**$34,312.70**	**$800.00**	**$33,512.70**	**1.88**	**109,374**
ECM 7	Install VFDs on Constant Volume (CV) HVAC	10,868	3.7	0.0	$1,779.89	$6,551.70	$800.00	$5,751.70	3.23	10,944
ECM 8	Install VFDs on Chilled Water Pumps	47,330	4.8	0.0	$7,751.28	$10,388.90	$0.00	$10,388.90	1.34	47,661
ECM 9	Install VFDs on Hot Water Pumps	50,417	5.5	0.0	$8,256.87	$17,372.10	$0.00	$17,372.10	2.10	50,769

ECM 7: Install VFDs on CV HVAC

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
10,868	3.7	0.0	$1,779.89	$6,551.70	$800.00	$5,751.70	3.23	10,944

Measure Description

This measure evaluates installing a variable frequency drive (VFD) to control the two 5 hp exhaust fan motors serving the laboratory. Energy savings result from reducing fan speed (and power) when there is a reduced load in the zone. The magnitude of energy savings is based on the amount of time at reduced loads.

ECM 8: Install VFDs on Chilled Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
47,330	4.8	0.0	$7,751.28	$10,388.90	$0.00	$10,388.90	1.34	47,661

Measure Description

This measure evaluates installing a variable frequency drive (VFD) to control a chilled water pumps. This measure requires that most of the chilled water coils be served by 2-way valves and that a differential pressure sensor is installed in the chilled water loop. As the chilled water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings result from reducing pump motor speed (and power) as chilled water valves close. The magnitude of energy savings is based on the amount of time at reduced loads.

For system with variable chilled water flow through the chiller, the minimum flow to prevent the chiller from tripping will have to be determined during the final project design. The control system should be programmed to maintain the minimum flow through the chiller and to prevent pump cavitation.

ECM 9: Install VFDs on Hot Water Pumps

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
50,417	5.5	0.0	$8,256.87	$17,372.10	$0.00	$17,372.10	2.10	50,769

Measure Description

This measure evaluates installing a variable frequency drive (VFD) to control a hot water pump. This measure requires that a majority of the hot water coils be served by 2-way valves and that a differential pressure sensor is installed in the hot water loop. As the hot water valves close, the differential pressure increases. The VFD modulates pump speed to maintain a differential pressure setpoint. Energy savings result from reducing pump motor speed (and power) as hot water valves close. The magnitude of energy savings is based on the amount of time at reduced loads.

4.1.4 Plug Load Equipment Control - Vending Machine

Our recommendations for plug load equipment controls are summarized in Figure 19 below.

Figure 19-Summary of Plug Load Equipment Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Plug Load Equipment Control - Vending Machine		**0**	**0.0**	**$0.00**	**$1,437.60**	**$0.00**	**$1,437.60**	**0.00**	**0**
ECM 10	Vending Machine Control	0	0.0	$0.00	$1,437.60	$0.00	$1,437.60	0.00	0

ECM 10: Vending Machine Control

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	0.0	$0.00	$1,437.60	$0.00	$1,437.60	0.00	0

Measure Description

Vending machines operate continuously, even during non-business hours. It is recommended to install occupancy sensor-based controls to reduce the energy use. These controls power down the machine when the surrounding area is vacant, then monitor the surrounding temperature and power up the cooling system at regular intervals to keep the product cool. Savings are a function of the activity level around the vending machine.

4.2 ECMs Evaluated but Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 20 – Summary of Evaluated but Not Recommended ECMs

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades	**3,877**	**1.2**	**0.0**	**$634.97**	**$11,192.76**	**$0.00**	**$11,192.76**	**17.63**	**3,904**
Premium Efficiency Motors	3,877	1.2	0.0	$634.97	$11,192.76	$0.00	$11,192.76	17.63	3,904
TOTALS	**3,877**	**1.2**	**0.0**	**$634.97**	**$11,192.76**	**$0.00**	**$11,192.76**	**17.63**	**3,904**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
3,877	1.2	0.0	$634.97	$11,192.76	$0.00	$11,192.76	17.63	3,904

Measure Description

This measure evaluates replacing chilled water, condenser water and heating hot water pumps standard efficiency motors with high efficiency motors. The evaluation assumes existing motors will be replaced with the same size motors. It is important that the speed of each new motor match the speed of the motor it replaces as closely as possible. The base case motor efficiencies are obtained from nameplate information. Proposed case premium motor efficiencies are obtained from the New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016). Savings are based on the difference between baseline and proposed efficiencies and the annual operating hours.

Reasons for not Recommending

The simple payback of this measure exceeds the expected useful life of the equipment and is therefore not recommended on the basis of energy savings alone.

5 Energy Efficient Practices

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of low or no-cost efficiency strategies. By employing certain behavioral and operational adjustments as well as performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and annual energy, operation, and maintenance costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. Consult with qualified equipment specialists for details on proper maintenance and system operation.

Perform Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20% - 60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6 – 12 months.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Use Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10 °F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

6 On-Site Generation Measures

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

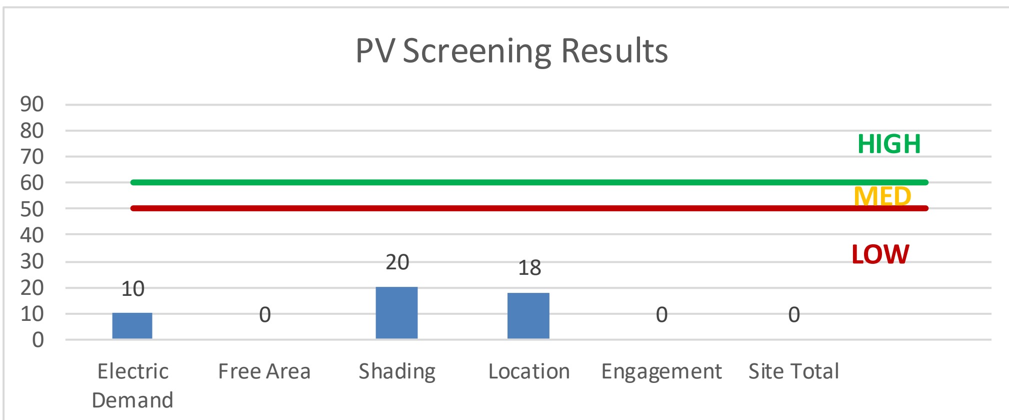
6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a **Low** potential for installing a PV array.

In order to be cost-effective, a solar PV array generally needs a minimum of 4,000 sq ft of flat or south-facing rooftop, or other unshaded space, on which to place the PV panels. In our opinion, the facility does appear not meet these minimum criteria for cost-effective PV installation.

Figure 21 - Photovoltaic Screening



For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

7 Demand Response

Demand Response (DR) is a program designed to reduce consumer electric load when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. DR service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability locally.

By enabling grid operators to call upon Curtailment Service Providers and energy consumers to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants will receive payments whether or not their facility is called upon to curtail their load.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR program often find it to be a valuable source of revenue for their facility(ies) because the payments can significantly offset annual utility costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats so that air conditioning units run less frequently or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR event cycle. DR program participants often have to install smart meters and may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding the program rules and requirements for metering and controls, a facility's ability to temporarily reduce electric load, as well as the payments involved in participating in the program. Also, these providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment to help ensure compliance of all terms and conditions of a DR contract.

8 Project Funding / Incentives

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section.. Please refer to Figure 22 for a list of the eligible programs identified for each recommended ECM.

Figure 22 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	X					
ECM 2	Retrofit Fluorescent Fixtures with LED Lamps and Drivers						
ECM 3	Retrofit Fixtures with LED Lamps	X					
ECM 4	Install LED Exit Signs						
ECM 5	Install Occupancy Sensor Lighting Controls	X					
ECM 6	Install High/Low Lighitng Controls						
ECM 7	Install VFDs on Constant Volume (CV) HVAC	X					
ECM 8	Install VFDs on Chilled Water Pumps						
ECM 9	Install VFDs on Hot Water Pumps						
ECM 10	Vending Machine Control						

SmartStart is generally well suited for implementation of individual or small sets of measures, with the flexibility to install projects at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities to bundle measures and simplify participation, but requires the use of pre-approved contractors. The Pay for Performance (P4P) program is a "whole-building" energy improvement program designed for larger facilities and requires implementation of multiple measures meeting minimum savings thresholds, as well as use of pre-approved consultants. The Large Energy Users Program (LEUP) is available to New Jersey's largest energy users giving them flexibility to install as little or as many measures, in a single facility or several facilities, with incentives capped based on the entity's annual energy consumption; applicants can use in-house staff or preferred contractor.

Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent comparison of available incentives.

Brief descriptions of all relevant alternative financing and incentive programs are located in the sections below. You may also check the following website for further information, including most current program availability, requirements, and incentive levels: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

<u>Prescriptive Equipment Incentives Available</u>:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The prescriptive path provides fixed incentives for specific energy efficiency measures whereas the custom measure path provides incentives for unique or specialized technologies that are not addressed through prescriptive offerings.

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at the lesser of 50% of the total installed incremental project cost, or a buy down to a one year payback (whichever is less). Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB.

8.2 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO."
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations.
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP.

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize the incentive programs to help further reduce costs when compiling the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 Energy Purchasing and Procurement Strategies

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third-party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third-party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third-party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third-party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third-party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third-party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third-party supplier, consider shopping for a reduced rate from third-party natural gas suppliers. If your facility is purchasing natural gas from a third-party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third-party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp	No	11	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.27	1,383	0.0	$226.46	$643.50	$110.00	2.36
Loading Dock Entrance - 1st Floor	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.05	251	0.0	$41.17	$117.00	$20.00	2.36
Loading Dock Entrance - 1st Floor	1	Exit Signs: Incandescent	None	45	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	393	0.0	$64.34	$107.56	$0.00	1.67
Room 128 - Storage	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp	Yes	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	2,319	0.15	794	0.0	$130.07	$408.50	$70.00	2.60
1st floor Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,732	Relamp	Yes	10	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,312	0.54	3,956	0.0	$647.91	$785.00	$100.00	1.06
1st floor Hallway	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,312	0.18	1,362	0.0	$222.98	$551.00	$60.00	2.20
1st floor Hallway	16	CFL Screw-In Lamps: Recessed fixture	Wall Switch	26	4,732	Relamp	Yes	16	LED Screw-In Lamps: Recessed fixture	High/Low Control	8	3,312	0.24	1,776	0.0	$290.89	$1,060.05	$0.00	3.64
1st floor Hallway	4	Exit Signs: Incandescent	None	45	8,760	Fixture Replacement	No	4	LED Exit Signs: 2 W Lamp	None	6	8,760	0.11	1,572	0.0	$257.38	$430.22	$0.00	1.67
Room 127 - Anatomy	2	CFL Screw-In Lamps: Recessed fixture	Wall Switch	26	4,732	Relamp	No	2	LED Screw-In Lamps: Recessed fixture	Wall Switch	8	4,732	0.03	196	0.0	$32.08	$107.51	$0.00	3.35
Room 127 - Anatomy	26	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,732	Relamp	Yes	26	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,312	1.20	8,850	0.0	$1,449.39	$2,071.20	$410.00	1.15
Room 132	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.18	1,362	0.0	$222.98	$467.00	$80.00	1.74
Room - 133	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.18	1,362	0.0	$222.98	$467.00	$80.00	1.74
Room - 134	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.12	908	0.0	$148.65	$350.00	$60.00	1.95
Room - 135	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.10	503	0.0	$82.35	$234.00	$40.00	2.36
Room - 136	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	Yes	6	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.18	1,362	0.0	$222.98	$467.00	$80.00	1.74
Room - 124	1	CFL Screw-In Lamps: Recessed fixture	Wall Switch	26	4,732	Relamp	No	1	LED Screw-In Lamps: Recessed fixture	Wall Switch	8	4,732	0.01	98	0.0	$16.04	$53.75	$0.00	3.35
Room - 124	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,732	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,312	0.92	6,808	0.0	$1,114.91	$1,620.00	$320.00	1.17
Room - 124	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,732	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,732	0.05	381	0.0	$62.39	$143.60	$20.00	1.98
Room - 122 - Biology	1	CFL Screw-In Lamps: Recessed fixture	Wall Switch	26	4,732	Relamp	No	1	LED Screw-In Lamps: Recessed fixture	Wall Switch	10	4,732	0.01	90	0.0	$14.71	$53.75	$0.00	3.66
Room - 122 - Biology	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,732	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,312	1.10	8,169	0.0	$1,337.89	$1,920.80	$380.00	1.15
Room - 116 - Ecology	1	CFL Screw-In Lamps: Recessed fixture	Wall Switch	26	4,732	Relamp	No	1	LED Screw-In Lamps: Recessed fixture	Wall Switch	10	4,732	0.01	87	0.0	$14.26	$53.75	$0.00	3.77
Room - 116 - Ecology	22	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,732	Relamp	Yes	22	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,312	1.01	7,488	0.0	$1,226.40	$1,770.40	$350.00	1.16
Room - 116 - Ecology	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,732	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,732	0.05	381	0.0	$62.39	$143.60	$20.00	1.98
1st floor Hallway east	1	Exit Signs: Incandescent	None	45	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	393	0.0	$64.34	$107.56	$0.00	1.67
1st floor Hallway east	5	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp	No	5	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.12	629	0.0	$102.94	$292.50	$50.00	2.36

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room - 108 - Janitor	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,732	0.02	180	0.0	$29.41	$58.50	$10.00	1.65
Men's Room	1	CFL Screw-In Lamps: Recessed fixture	Occupancy Sensor	26	3,312	Relamp	No	1	LED Screw-In Lamps: Recessed fixture	Occupancy Sensor	10	3,312	0.01	63	0.0	$10.29	$53.75	$0.00	5.22
Men's Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.10	503	0.0	$82.35	$234.00	$40.00	2.36
Men's Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	3,312	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,312	0.03	133	0.0	$21.83	$71.80	$10.00	2.83
Womens room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	3,312	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,312	0.03	133	0.0	$21.83	$71.80	$10.00	2.83
Womens room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Occupancy Sensor	62	3,312	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.10	503	0.0	$82.35	$234.00	$40.00	2.36
Womens room	1	CFL Screw-In Lamps: Recessed fixture	Occupancy Sensor	26	3,312	Relamp	No	1	LED Screw-In Lamps: Recessed fixture	Occupancy Sensor	10	3,312	0.01	63	0.0	$10.29	$53.75	$0.00	5.22
Room - 114 - Lecture hall	26	CFL Screw-In Lamps: Recessed fixture	Occupancy Sensor	26	3,312	Relamp	No	26	LED Screw-In Lamps: Recessed fixture	Occupancy Sensor	10	3,312	0.32	1,634	0.0	$267.63	$1,397.58	$0.00	5.22
Room - 114 - Lecture hall	8	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	3,312	Relamp	No	8	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,312	0.10	533	0.0	$87.34	$287.20	$40.00	2.83
Room - 114 - Lecture hall	2	Exit Signs: Incandescent	None	45	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.06	786	0.0	$128.69	$215.11	$0.00	1.67
2nd Floor Hallway	8	Metal Halide: (1) 175W Lamp	Wall Switch	215	4,732	Fixture Replacement	Yes	8	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Occupancy Sensor	89	3,312	0.90	6,648	0.0	$1,088.71	$4,885.42	$1,080.00	3.50
2nd Floor Hallway	10	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,732	Relamp	Yes	10	LED - Linear Tubes: (3) 4' Lamps	High/Low Control	44	3,312	0.46	3,404	0.0	$557.46	$952.00	$150.00	1.44
2nd Floor Hallway	9	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	Yes	9	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	3,312	0.28	2,042	0.0	$334.47	$726.50	$90.00	1.90
2nd Floor Hallway	3	CFL Screw-In Lamps: Recessed fixture	Wall Switch	26	4,732	Relamp	No	3	LED Screw-In Lamps: Recessed fixture	Wall Switch	10	4,732	0.04	269	0.0	$44.12	$161.26	$0.00	3.66
2nd Floor Hallway	5	Exit Signs: Incandescent	None	45	8,760	Fixture Replacement	No	5	LED Exit Signs: 2 W Lamp	None	6	8,760	0.14	1,964	0.0	$321.72	$537.78	$0.00	1.67
Men's Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,732	0.02	180	0.0	$29.41	$58.50	$10.00	1.65
Men's Room	1	CFL Screw-In Lamps: Recessed fixture	Wall Switch	26	4,732	Relamp	No	1	LED Screw-In Lamps: Recessed fixture	Wall Switch	10	4,732	0.01	90	0.0	$14.71	$53.75	$0.00	3.66
Men's Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,732	0.05	359	0.0	$58.82	$117.00	$20.00	1.65
Women's room	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,732	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,732	0.01	95	0.0	$15.60	$35.90	$5.00	1.98
Women's room	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.12	908	0.0	$148.65	$504.00	$75.00	2.89
Women's room	1	CFL Screw-In Lamps: Recessed fixture	Wall Switch	26	4,732	Relamp	No	1	LED Screw-In Lamps: Recessed fixture	Wall Switch	10	4,732	0.01	90	0.0	$14.71	$53.75	$0.00	3.66
Room - 227 - Microbiology	1	CFL Screw-In Lamps: Recessed fixture	Wall Switch	26	4,732	Relamp	No	1	LED Screw-In Lamps: Recessed fixture	Wall Switch	10	4,732	0.01	90	0.0	$14.71	$53.75	$0.00	3.66
Room - 227 - Microbiology	20	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,732	Relamp	Yes	20	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,312	0.92	6,808	0.0	$1,114.91	$1,620.00	$320.00	1.17
Room - 227 - Microbiology	4	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,732	Relamp	No	4	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,732	0.05	381	0.0	$62.39	$143.60	$20.00	1.98
Room 232	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.12	908	0.0	$148.65	$350.00	$60.00	1.95

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 233	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.12	908	0.0	$148.65	$350.00	$60.00	1.95
Scale Roof	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,732	0.02	180	0.0	$29.41	$58.50	$10.00	1.65
Room 234	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.12	908	0.0	$148.65	$350.00	$60.00	1.95
Room 235	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	Yes	4	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	3,312	0.12	908	0.0	$148.65	$350.00	$60.00	1.95
Room 236 - Conference Room	12	CFL Screw-In Lamps: Recessed fixture	Occupancy Sensor	26	3,312	Relamp	No	12	LED Screw-In Lamps: Recessed fixture	Occupancy Sensor	10	3,312	0.15	754	0.0	$123.52	$645.04	$0.00	5.22
Room 236 - Conference Room	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Occupancy Sensor	32	3,312	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	3,312	0.03	133	0.0	$21.83	$71.80	$10.00	2.83
Room 224	1	CFL Screw-In Lamps: Recessed fixture	Wall Switch	26	4,732	Relamp	No	1	LED Screw-In Lamps: Recessed fixture	Wall Switch	10	4,732	0.01	90	0.0	$14.71	$53.75	$0.00	3.66
Room 224	25	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,732	Relamp	Yes	25	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,312	1.15	8,510	0.0	$1,393.64	$1,996.00	$395.00	1.15
Room 224	5	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,732	Relamp	No	5	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,732	0.06	476	0.0	$77.98	$179.50	$25.00	1.98
Room 222 - Chemistry	23	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,732	Relamp	Yes	23	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,312	1.06	7,829	0.0	$1,282.15	$1,845.60	$365.00	1.15
Freezer Laborotary	5	Linear Fluorescent - T12: 2' T12 (20W) - 2L	Wall Switch	50	4,732	Fixture Replacement	No	5	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,732	0.08	571	0.0	$93.58	$417.15	$0.00	4.46
Freezer Laborotary	4	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	4,732	Relamp	No	4	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,732	0.10	718	0.0	$117.64	$234.00	$40.00	1.65
Room - 216 - Organic chemistry	1	CFL Screw-In Lamps: Recessed fixture	Wall Switch	26	4,732	Relamp	No	1	LED Screw-In Lamps: Recessed fixture	Wall Switch	10	4,732	0.01	90	0.0	$14.71	$53.75	$0.00	3.66
Room - 216 - Organic chemistry	24	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	4,732	Relamp	Yes	24	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	3,312	1.10	8,169	0.0	$1,337.89	$1,920.80	$380.00	1.15
Room - 216 - Organic chemistry	11	Linear Fluorescent - T12: 2' T12 (20W) - 2L	Wall Switch	50	4,732	Fixture Replacement	No	11	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	4,732	0.17	1,257	0.0	$205.87	$917.73	$0.00	4.46
Room - 216 - Organic chemistry	2	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	4,732	Relamp	No	2	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	4,732	0.03	190	0.0	$31.19	$71.80	$10.00	1.98

Motor Inventory & Recommendations

		Existing Conditions						Proposed Conditions				Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	Hiering science building	2	Chilled Water Pump	15.0	91.0%	No	3,391	Yes	93.0%	Yes	2	5.19	48,540	0.0	$7,949.55	$14,082.34	$0.00	1.77
Mechanical Room	Hiering science building	2	Condenser Water Pump	7.5	88.5%	No	3,391	Yes	91.0%	No		0.26	883	0.0	$144.68	$2,262.88	$0.00	15.64
Mechanical Room	Hiering science building	2	Heating Hot Water Pump	7.5	89.5%	No	3,391	Yes	91.0%	Yes	2	2.61	24,657	0.0	$4,038.08	$9,476.48	$0.00	2.35
Mechanical Room	Hiering science building	1	Cooling Tower Fan	7.5	88.5%	No	3,391	Yes	91.0%	Yes	1	1.35	12,490	0.0	$2,045.52	$4,738.24	$0.00	2.32
Mechanical Room	Hiering science building	1	Other	0.8	78.0%	No	2,745	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Elevator Room	Hiering science building	1	Other	20.0	91.0%	No	3,391	No	91.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room	Hiering science building	1	Heating Hot Water Pump	5.0	84.0%	No	2,745	No	84.0%	Yes	1	0.89	7,070	0.0	$1,157.82	$3,275.85	$0.00	2.83
Boiler Room	Hiering science building	1	Heating Hot Water Pump	5.0	84.0%	No	2,745	No	84.0%	Yes	1	0.89	7,070	0.0	$1,157.82	$3,275.85	$0.00	2.83
Mechanical Room	Hiering science building	2	Air Compressor	10.0	90.7%	No	4,957	No	90.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	York Air Handler Unit 1	1	Supply Fan	15.0	94.5%	Yes	3,391	No	94.5%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	York Air Handler Unit 1	1	Return Fan	2.0	88.7%	No	2,745	No	88.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	York Air Handler Unit 2	1	Supply Fan	40.0	94.7%	Yes	4,067	No	94.7%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Rooftop	Science Laboratory	2	Exhaust Fan	5.0	84.5%	No	2,745	Yes	89.5%	Yes	2	4.06	11,782	0.0	$1,929.55	$8,393.82	$800.00	3.94

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Roof	Hiering Science Building	1	Packaged AC	15.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric Chiller Inventory & Recommendations

		Existing Conditions			Proposed Conditions							Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	Chiller Quantity	System Type	Cooling Capacity per Unit (Tons)	Install High Efficiency Chillers?	Chiller Quantity	System Type	Constant/ Variable Speed	Cooling Capacity (Tons)	Full Load Efficiency (kW/Ton)	IPLV Efficiency (kW/Ton)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Central Plant	Hiering Science Building	1	Water-Cooled Screw Chiller	280.00	No							0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room	Hiering Scince Building	2	Non-Condensing Hot Water Boiler	1,709.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof	Hiering Scince Building	1	Furnace	280.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Mechanical Room	Hiering science building	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
Hiering science building	49	Computer With LCD Monitor	191.0	No
Hiering science building	1	Coffee machine	850.0	No
Hiering science building	9	Projector	200.0	No
Hiering science building	6	Printer/copier - Big	515.0	No
Hiering science building	4	Printer - Small	20.0	No
Hiering science building	5	Microwave	1,000.0	No
Hiering science building	7	Refrigerator - Small	10.0	No
Hiering science building	2	Elec. Aquarium	5.0	No

Vending Machine Inventory & Recommendations

	Existing Conditions		Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Vending Machine Type	Install Controls?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Hiering Science Building	2	Refrigerated	No	0.00	0	0.0	$0.00	$1,437.60	$0.00	0.00

Appendix B: ENERGY STAR® Statement of Energy Performance

ENERGY STAR® Statement of Energy Performance

LEARN MORE AT energystar.gov

N/A

ENERGY STAR® Score[1]

Ocean County College

Primary Property Type: College/University
Gross Floor Area (ft²): 526,034
Built: 1966

For Year Ending: June 30, 2015
Date Generated: June 21, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Ocean County College 1 College Drive Toms River, New Jersey 08754	Ocean County College 1 College Drive Toms River, NJ 08754 732-255-0533	James Calamia 1 College Drive Toms River, NJ 08754 732-255-0533 jcalamia@ocean.edu

Property ID: 5093695

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
173.3 kBtu/ft²

Source EUI
324 kBtu/ft²

Annual Energy by Fuel

Other: (kBtu)	4,536,360 (5%)
Natural Gas (kBtu)	50,787,318 (56%)
Electric - Grid (kBtu)	35,847,151 (39%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	140.5
National Median Source EUI (kBtu/ft²)	262.6
% Diff from National Median Source EUI	23%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	N/A

Signature & Stamp of Verifying Professional

I _________________ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: ______________________Date: ___________

Licensed Professional

____ ________
,
(___)____-______
____

Professional Engineer Stamp
(if applicable)